CLAIMS

WHAT IS CLAIMED:

1. A method, comprising:

depositing a first layer of conductive material onto a substrate having formed therein an opening in a sputter deposition atmosphere having a first state with a pressure of a first value and a bias power of a first value for accelerating target ions towards said substrate;

establishing a second state for said sputter deposition atmosphere by increasing at least one of said bias power and said pressure to a second value; and

depositing a second layer of conductive material in said sputter deposition atmosphere, said sputter deposition atmosphere being in said second state.

2. The method of claim 1, wherein a bias voltage and a pressure of said deposition atmosphere in said first state is selected so as to obtain a thickness of said first layer that is greater at an upper portion of said opening as compared to a bottom portion of said opening.

3. The method of claim 1, wherein a bias voltage and a pressure of said deposition atmosphere in said second state is selected so as to obtain a thickness of said second layer that is greater at a bottom portion of said opening as compared to a top portion of said opening.

4. The method of claim 2, wherein a pressure in said first state is in the range of approximately 1-5 milliTorr.

5. The method of claim 2, wherein a bias power for accelerating target ions towards said substrate in said first state is in the range of approximately 0-300 Watts.

6. The method of claim 1, wherein said pressure in said second state is higher than approximately 8 milliTorr.

7. The method of claim 1, wherein said bias power in said second state is approximately equal to or higher than 400 Watts.

8. The method of claim 1, wherein said first layer comprises at least one of tantalum, tantalum nitride, titanium and titanium nitride.

9. The method of claim 1, wherein said second layer comprises at least one of tantalum, tantalum nitride, titanium and titanium nitride.

10. The method of claim 1, wherein a material composition of said deposition atmosphere in said first state differs from that in said second state.

11. The method of claim 1, wherein a material composition of said deposition atmosphere in said first state is substantially the same as that in said second state.

12. The method of claim 10, further comprising supplying a precursor gas to said deposition atmosphere at least during a part of at least one of said first and said second states.

13. The method of claim 11, further comprising supplying a precursor gas to said deposition atmosphere at least during a part of said first and said second states.

14. A method of controlling a deposition rate in an ionized sputter deposition process, the method comprising a sequence including:

providing a substrate having formed therein at least one via opening with an upper portion and a lower portion;

establishing a deposition atmosphere around said substrate with a specified pressure and a specified bias power for directing target ions towards said substrate;

determining a thickness of a deposited layer at said upper portion and said lower portion of said via opening; and

increasing at least one of said bias power and said pressure when an absolute amount of a difference of the thickness at said lower portion and said upper portion is less than a predefined threshold.

15. The method of claim 14, further comprising repeating said sequence until said absolute amount is within a target range and using a bias power and a pressure yielding said absolute amount within said target range for forming a barrier layer in vias and trenches of a product substrate.

16. The method of claim 14, wherein at least one of tantalum, tantalum nitride, titanium and titanium nitride is deposited.

17. A method, comprising:

forming, by sputter deposition, a conductive material layer over an interconnect opening formed on a substrate, wherein a bias power for enhancing a directionality of deposition particles and a pressure are selected to provide a greater thickness of said conductive material layer at an upper portion of said interconnect opening compared to a lower portion thereof;

increasing said bias power and said pressure; and

continuing the formation of said conductive material layer to predominantly deposit said conductive material layer at the lower portion.

18. The method of claim 17, wherein said increased pressure is higher than approximately 8 milliTorr.

19. The method of claim 17, wherein said increased bias power is approximately equal to or higher than 400 Watts.

20. The method of claim 17, wherein said first layer comprises at least one of tantalum, tantalum nitride, titanium and titanium nitride.

21. The method of claim 17, wherein a material composition after increasing said bias power and said pressure in said deposition atmosphere differs from a material composition prior to increasing said bias power and said pressure.

22. The method of claim 17, wherein a material composition of said deposition atmosphere remains substantially constant.

23. The method of claim 17, further comprising supplying, at least temporarily, a precursor gas to the deposition atmosphere.